

## PANGUITCH LAKE



### Introduction

Panguitch Lake was a natural lake encompassing 777 acres until it was enlarged by a 22 foot dam to become a reservoir with a maximum surface area of 1,248 acres. It is a large midelevation lake on the Markagunt Plateau, between Panguitch and Cedar Breaks National Monument. The lake is located in the Dixie National Forest in a high tourist use area near three national parks and

one national monument. In recent year there has been a significant number of summer homes built in the area by residents from neighboring states in addition to Utah residents.

### Characteristics and Morphometry

Lake elevation (meters / feet)	2,502 / 8,208
Surface area (hectares / acres)	505 / 1,248
Watershed area (hectares / acres)	9,583 / 23,680
Volume (m <sup>3</sup> / acre-feet)	
capacity	29,271,000 / 23,730
conservation pool	0
Annual inflow (m <sup>3</sup> / acre-feet)	
Retention time (years)	
Drawdown (m <sup>3</sup> / acre-feet)	
Depth (meters / feet)	
maximum	20 / 66
mean	5.8 / 19
Length (km / miles)	3.22 / 2
Width (km / miles)	1.77 / 1.1
Shoreline (km / miles)	8.8 / 5.5

### Location

County	Garfield
Longitude / Latitude	112 38 34 / 37 42 50
USGS Maps	Panguitch Lake 1958
Cataloging Unit	Upper Sevier River (16030001)

The earliest know human use of the lake was as a fishery by the Piute Indians before the advent of the Caucasians into the area. The name Panguitch means "big fish" in the Piute language. The earliest record of Caucasians visiting the lake was in early June of 1852 when the old Indian chief, Quinarra (Kanara), requested the Mormon leaders at Parowan to visit a group of about 100 Piutes who were camped at the lake, catching fish and drying them for their winter supply of food (Woodbury, 1950).

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The original dam was of rock masonry and was constructed to a height of 12 feet. A 6 foot high masonry extension was added in 1912 and an additional 2 feet in 1921. In 1942 a concrete cap, 2 feet wide and 2 feet high, was placed on the top of the existing dam raising the dam height to a total of 22 feet. Due to seepage problems the dam was grouted and a concrete layer was placed on the backside of the dam in the mid 1970's. Historically Panguitch Lake has been a very popular fishery not only for residents of Utah but those states adjoining or in close proximity to the area.

The reservoir shoreline is 45% owned by the Dixie National Forest, the remainder being privately owned. Public access is unrestricted. Defined beneficial uses include: water recreation excluding swimming, propagation of cold water species of game fish and aquatic life, and agricultural needs.

### Recreation

Panguitch Lake is directly accessible from U-143, 17 miles southwest of Panguitch and 16 miles east of Cedar Breaks National Monument. U-143 follows the shoreline for several miles. Campgrounds and resorts are well marked.

Panguitch Lake is an excellent location for recreation year around, including waterskiing, picnicking, camping, cross country skiing and snowmobiling. Usage is heavy from Memorial Day to Labor Day. It has also become a popular site for ice fishing during the winter months.

There are two USFS campgrounds south of the lake, Panguitch Lake North and Panguitch Lake South. Both have flush toilets, electrical hookups, picnic areas, family and multi-family units with tables, water, fire pits, and asphalt roadways. The south campground has mainly tent sites, while the north campground has R.V. trailer sites. Fees are charged for use.



There are four private resorts on Panguitch Lake, each with many services, including gasoline and

groceries. Their names and telephone numbers are listed in the Information box.

### Watershed Description

Panguitch Lake is a natural body of water that was augmented with a series of dams culminating in the late 1970's. Construction of the dam has changed the original depth from 35 feet to 57 feet and the surface area from 777 acres to 1,248 acres.

The watershed high point, Sidney Peaks, is 3,371 meters (11,060 ft) above sea level, thereby developing a complex slope of 7.4% to the reservoir. There are three tributary streams, Ipson Creek, Clear Creek and Blue Spring Creek, whose headwaters originate at the brink of the Markagunt Plateau and flow south and east to Panguitch Lake. Deer Creek in the Blue Spring Creek drainage is actively pirating drainage area from the Mammoth Creek Basin. Panguitch Lake drains into Panguitch Creek, which joins the Sevier River in Panguitch. There are no upstream impoundments. The average stream gradient above the Lake is 4.4% (234 feet per mile).

The soil in the area is derived from the underlying volcanic rocks. The soil associations that compose the watershed are listed in Appendix III.

The vegetation communities are comprised of pine, aspen, spruce-fir, oak and maple. The watershed receives 25 - 51 cm (10 - 20 inches) of precipitation annually with a frost-free season of 60 - 80 days at the reservoir.

Land use in the watershed is mostly multiple use but with substantial vacation home development. Overgrazing has resulted in severe stream bank erosion in the tributaries, which was addressed in Panguitch Lake Restoration, a document published by the DWQ and EPA. In a project area on Blue Springs Creek, grazing was eliminated and stream restoration projects implemented. This resulted in substantial improvements to the riparian corridor for those streams involved and to an extent, the water quality of Panguitch Lake. In addition the overall restoration project consisted of construction of a fish cleaning station and increased public awareness of the aspects of water pollution. If improved management practices are implemented throughout the watershed, both with development and ranching, the water quality is expected to continue to recover.

### Limnological Assessment

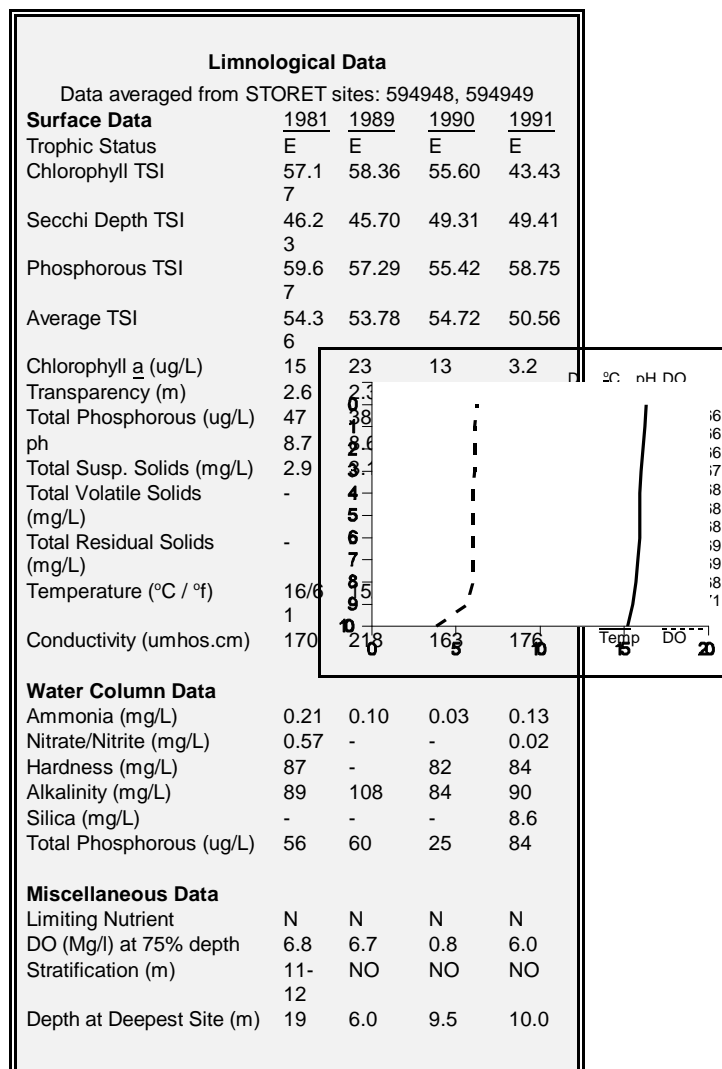
The water quality of Panguitch Lake is fair. It is considered to be moderately hard with a hardness concentration value of approximately 84 mg/L (CaCO<sub>3</sub>). Those parameters that have exceeded State water quality standards for defined beneficial uses are total phosphorus and dissolved oxygen. The average concentrations of total

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phosphorus in the water column in recent years has usually always exceeded the recommended pollution indicator for phosphorus of 25 ug/L. Those problems relating to the excessive enrichment of Panguitch Lake has been documented in several reports. In the 1975 NES report it was ranked as 25<sup>th</sup> in water quality of the 27 lakes surveyed in Utah. It was judged to eutrophic, nitrogen limited, and receiving a eutrophic loading of 0.36 gm/m<sup>2</sup>/yr (1,815 Kg/m<sup>2</sup>/yr) of phosphorus. Historically the data documents summer blue-green algal blooms, winter and summer hypolimnetic oxygen deficits and fish kills have been problems associated with the lake.

In 1980 a Clean lakes 314 Phase I water quality study was initiated on the lake. A summary of that study (Panguitch Lake Phase I Study, 1983) indicate that the

has good water quality as measured by most parameters. The lake is moderately low in alkalinity and hardness (80 mg/L). Secchi depth readings for the study period during



the summer months range from 1 to 7 meters which is typical for slightly eutrophic systems. Nutrient levels in the epilimnion are relatively high but drop during the summer as nutrients are depleted by phytoplankton growth. Total phosphorus levels were commonly reported at 20 to 100 ug/L and inorganic nitrogen at 0.10 to 0.50 mg/L.

As expected, dissolved oxygen was low in the hypolimnion with temperature and dissolved oxygen profiles typical when compared to other mesotrophic to slightly eutrophic lakes in Utah. However, severe oxygen depletions were found near the lake bottom during late summer and again during the winter.

Panguitch Lake was determined to be eutrophic in both 1981 and 1982 based on overall trophic state indexes (TSI's). As part of the study Dr. Samuel R. Rushforth (1982) algal studies substantiated these trophic state determinations. He concluded that Panguitch Lake is a eutrophic system dominated by noxious species of blue-green algae (*Anabaena*, *Aphanizomenon*, and *Microcystis*) during the summer and fall months. It was also determined that exchangeable phosphorous values in the sediments were relatively small and that internal phosphorus loadings should be minimal, if the hypolimnion can be kept aerobic.

Current data still indicates that the lake is nitrogen limited with TSI values still in the eutrophic range. It appears that there has been a slight improvement of conditions since the implementation of some restoration work in the watershed on Deer Creek and Bunker Creek, tributaries of Blue Spring Creek.

Although the profile of September 9, 1991 doesn't indicate the presence of a thermocline, the reservoir does stratify during the summer. There are also still problems with the depletion of dissolved oxygen in the water column due to the high demand for oxygen in decomposition and respiration carried on by extensive beds of macrophytes and algae during later summer and throughout the winter.

An ever increasing problems is the massive beds of macrophytes that limit accessibility to large portions of the lake during late summer. It is estimated at times that approximately 1/3 of the lakes surface area is affected with emergent vegetation or submergent macrophytes near the surface. These large mats of algae and macrophytes impact the fishery and as they die off exert a large demand on the dissolved oxygen in the water column during decomposition. Five species of rooted aquatic macrophytes were found in Panguitch Lake during the Phase I study. Small beds of *Polygonum coccineum* and *Ranunculus aquatilis* occurred in shallow areas on the north, east and southeast shores of the lake with extensive beds of the two species occurring the shallow western shoreline of the lake. In places the two species occur up to 600 feet from the shoreline. Two species of *Potamogeton*, *P. filiformis* and *P. pectinatus* occurred throughout the macrophyte beds with *P. coccineum* and *R. aquatilis* extending 100 to 200 feet farther out into deeper water beyond the beds of *Polygonum* and *Ranunculus*. *Myriophyllum spicatum* was found in the boat dock areas and along steeper shorelines as well as the deep water border of the macrophyte beds.

According to DWR no fish kills have been reported in recent years. The lake supports populations of rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*Oncorhynchus clarki*), brown trout (*Salmo trutta*),

and brook trout (*Salvelinus fontinalis*). Observed benthos includes mayflies, midges, copepods, and *Daphnia*. The DWR treated Panguitch Lake with rotenone in 1973 and again in September, 1991, in an attempt to eliminate nongame species. It was then restocked with 250,000 fingerling and 10,000 catchable rainbow trout and 20,000 fingerling each of brown trout and brook trout.

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume% Density (mm <sup>3</sup> /liter) By Volume
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*Anabaena spiroides*

#### Information

Dixie National Forest

Ranger District

Deer Creek Lodge

Beaver Dam Lodge

Panguitch Lake Resort

676-2657

Lake View Resort

676-2650

Rustic Lodge

676-2639

Five County Association of Governments

West Panguitch Irrigation Company

Division of Wildlife Resources

538-4700

Division of Water Quality

538-6146

<i>v. crassa</i>	40.476	76.41
<i>Sphaerocystis schroeteri</i>	7.923	14.96
<i>Stephanodiscus niagarae</i>		2. 8 1 5
5.32		
<i>Pediastrum duplex</i>	0.667	1.26
Pennate diatoms	0.107	0.20
<i>Asterionella formosa</i>	0.075	0.14
<i>Melosira granulata</i>	0.054	0.10
Centric diatoms	0.044	0.08
<i>Oocystis sp.</i>	0.025	0.05
<i>Gomphosphaeria aponina</i>		0. 0 1 8
0.03		
<i>Staurostrum gracile</i>	0.017	0.03
<i>Ankistrodesmus falcatus</i>	0.008	0.02
<i>Chlamydomonas globosa</i>		0. 0 0 4
0.01		

Total	52.900
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Shannon-Weaver [H']	0.81
Species Evenness	0.31
Species Richness	0.53

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Although this is an unusually diverse flora a Utah lake, it is dominated by the presence of blue-green algae indicative of impaired water quality from excessive productivity. The extensive diversity may be a result of heavy macrophyte growth providing a increased diversity of algal habitats.

### **Pollution Assessment**

Nonpoint sources of pollution in Panguitch Lake include: recreational wastes such as litter, and human wastes; silviculture activities which increase the potential for sedimentation from denuded land; grazing which tends to increase sedimentation from devegetation and nutrient loading and pathogen introduction from excrement.

The documentation of water quality problems and recommendations to control sources are contained in the study, *Panguitch Lake Phase I Clean Lakes Study* (1983). The goal of the restoration effort is to control those sources of phosphorus within the watershed. This would reduce nutrient loading to the lake and reduce the productivity associated with the lake. Primary areas focused on include control of sewage disposal, grazing activities not only in the watershed but in direct proximity of the lake, erosion and sediment control, and education. It is also evident that with the increasing macrophyte problems that efforts will need to be implemented to reduce the effect they are exhibiting on water quality in the lake. Increased vacation home development and recreational use and the need for more timber harvest due to losses associated with beetle infestations, unless carefully managed, may contribute to the already stressed water quality problems associated with Panguitch Lake.

There are no point pollution sources currently known in the watershed.

### **Beneficial Use Classification**

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).